Section 21

LECTURE

Diagnostic and Therapeutic Endoscopy
DIAGNOSTIC AND THERAPEUTIC ENDOSCOPY FOR THE GI TRACT
or
The endoscopic revolution in the practice of gastroenterology

A. Historical perspectives on endoscopy

1800’s - Early endoscopes: Hollow tubes, magnifying lens, and proximal light

1930- Semiflexible gastroscope – Rudolph Schindler
  Flexibility obtained with a series of prisms but limited view
  Distal light, ability to biopsy

1959 – The Fiberoptic revolution – Basil Hirschowitz
  complete flexibility without loss of image

Subsequent milestones in endoscopic development
1960-1970 Diagnostic gastroscopy, introduction of colonoscopy

1970-1980 Endoscopic cholangiopancreatography
  Introduction of therapeutic endoscopy
  Treatment of bleeding, removal of polyps, bile duct stones

1980-1990 Advent of Video endoscopy
  Endoscopic ultrasonography
  Improved treatment of strictures – Placement of feeding tubes

1990-2000 Explosion of Laparoscopic surgery
  Small bowel endoscopy
  Self expanding metal stents
  Endoscopic mucosal resection

2000- Video Capsul endoscopy
  Intraluminal therapy of gastroesophageal reflux
  Improved Dx with oculocoherence, fluourescence, magnification
B. Impact of endoscopy on gastroenterology – predictable course

1. Initially only improved diagnosis – Hohum!
2. Then therapeutic potential – This looks interesting!
3. Eventually can replace surgery – Sign me up!!!
4. Spin – off: Changed concepts of GI disease
   - Relationship of colon polyps to cancer
   - Peptic ulcer as an infectious disease
   - Sources of GI bleeding
   - Premalignant changes in chronic GI inflammation

C. The endoscope

- Color Videochip camera transmits high resolution digital image
- External light transmitted through fiberoptic bundles
- Ability to control direction of viewing tip through 360°
- Instrument channel(s) permit sampling, therapeutic maneuvers
- Ability to insufflate air, cleanse lens
- Instruments of various lengths, diameter, and stiffness depending on examination
  - Indication and age of patient
  - Side viewing instruments for work in the biliary tree and pancreas

D. Technique

- Outpatient procedure using conscious sedation and topical anaesthesia
- Only therapeutic interventions with high likelihood of complications need to be admitted
- Patient acceptance high and comparable to Xray
  - Retrograde amnesia with sedatives
- Routine complete upper and lower GI visualization. Potential for visualization of much of small bowel
- Contraindications: few: perforation, active ischemia
- Complications
  - Few for diagnostic studies. Perforation 1/3000 or less
  - Significant for therapeutic procedures but generally equal to (in young) or less than comparable surgery (in old)
  - Accelerated recovery

Costs: Endoscope and processors, video monitors @ 45,000
1/10 the cost of modern flouroscopy equipment
Cost for procedure @ 1.5x comparable radiologic procedure due to support personnel for conscious sedation.
Order of magnitude less than comparable surgery

II. USES OF ENDOSCOPY

Upper GI endoscopy – Esophagogastroduodenoscopy
Routine visualization to third portion of the duodenum
Therapeutic applications for each diagnostic indication

A. Upper GI bleeding
Non-variceal bleeding
Early endoscopy the preferred approach
Identify, treat the high risk lesion
Permit early discharge of low risk patients
Many radiologically undetectable lesions
Mallory-Weiss tears, AV malformations

Risk stratification of bleeding lesions predicts likelihood of rebleeding and surgery
Spurting vessel – 80-90%
The visible vessel- Raised platelet thrombus in ulcer base: 35-50%
Adherent clot or oozing vessel 30%
All of above indications for therapy

Therapeutic devices:
Bipolar electrodes, heater probe (steam iron), vascular clips, Injection
Therapy with epinephrine, etoh.
Argon lasers, cryotherapy for vascular ectasias
Demonstrated effectiveness by metaanalysis re transfusion, surgery, mortality

Variceal Bleeding
Control with injection of sclerosants, neoprene band ligation
Retreatment till esophageal varices eliminated

B. Swallowing Disorders - Dysphagia and Odynophagia
Almost always organic, absolute indication
Rings, strictures, tumors
Therapy
Removal of foreign bodies, its amazing what some people will swallow
Dilating balloon, wire guided bougies
Value of Self expanding metal stents as palliation for tumors

C. Dyspepsia and Esophageal Reflux
10-30% of ulcers missed,
Identification of helicobacter and diffuse gastritis and reflux esophagitis
Barrett’s esophagus
Therapy
Endoluminal therapy of esophageal reflux
Fundoplication with endoscopically placed sutures, staples, radiofrequency ablation
  injection of polymers
  The endoscopic sewing machine
Photodynamic therapy of Barrett’s esophagus with ablation

D. Suspected malignant and premalignant lesion
Accurate diagnosis of ulcers, polyp, thickened folds
Surveillance of premalignant lesions-dysplasia/carcinoma in situ
  Biopsy, flow cytometry, vital staining

Therapy
Endoscopic mucosal resection of superficial lesions (See EUS)
Favorable Japanese experience with early CA of the stomach
Polypectomy – major importance in the colon.

E. Nutrition
Percutaneous endoscopic feeding tubes in stomach, small intestine
  Simplify care of neurologically impaired and those with aspiration

Endoscopic ultrasound
Technique for closer imaging of upper and lower GI tract
Small high frequency ultrasound attached to endoscope or probes
  Short penetration but high sensitivity
Uses:
  Staging of esophageal, gastric, pancreatic cancers
  Diagnose nature of submucosal lesions – Mass vs vascular
differentiate vascular lesions
Best visualization of small lesions of pancreas, ability to do FNA
  Aspirate and characterize cystic lesions of the pancreas
  Drainage of pancreatic pseudocysts

III. RETROGRADE CHOLANGIOPANCREATOGRAPHY - CANNULATION OF THE AMPULLA OF VATER

A. Indications

Obstructive jaundice
Ineffectiveness of conventional radiology
Preferred alternative to skinny needle cholangiography
Route for nonoperative interventions (v.i.)
Biopsy of ampullary tumors
Recurrent pancreatitis
Predicts effectiveness of surgery
Determines operative approach
Definition of cysts, fistula
Removal of stones

Unexplained pancreobiliary pain
Suspected pancreatic CA, if imaging techniques not definitive
   Differentiation between carcinoma and pancreatitis may be difficult
Manometry for "papillary stenosis". Response to sphincterotomy
Pancreatic anomalies

B. Therapy - Need for surgery of the biliary tree decreasing.

Common duct stones
Endoscopic papillotomy and extraction of stones
Procedure of choice for retained, recurrent stones
   Complications comparable or less than surgery
Recovery - 2 days vs. 2 months
Sub-optimal risks with CDS and intact gallbladder
   Rarely require subsequent cholecystectomy
Still a problem with oversized stones
   Use of crushing baskets, lasers, lithotripsy, long term stents

Treatment of acute cholangitis and gallstone pancreatitis
   Safe, effective, essential for severe cholangitis
   Safe in pancreatitis - improves survival in severe disease
   Limited population at risk

Malignant obstruction of the common duct
Pancreatic, ampullary, or primary bile duct malignancy
   Metastatic tumors to porta hepatitis
Insertion of indwelling stents and drains
   For temporary drainage as preparation for surgery
   As permanent therapy in inoperable metastatic disease
   Prolonged patency and stent exchange PRN
Insertion of expandable metal stents
   Several varieties
   Large size = longer patency but tumor ingrowth
   Non-removable

Benign bile duct injury especially after laparoscopic cholecystectomy
Strictures: dilation with inflatable balloon
Fistula: stent until leak closes
Therapeutic techniques for the pancreatic duct
Pancreatic cysts
  drainage into stomach, duodenum
Obstructing pancreatic stones
  papillotomy and removal
Stenting and ballooning of strictures, stenotic ampulla
  Potential dangers of long term stenting
Pancreas Divisum: Association with increased risk of pancreatitis?

Duodenoscope assisted choledocho-pancreatoscopy
Mother daughter endoscope allows direct inspection of ducts
Visual scrutiny of possible malignant strictures, cytology
Vehicle for delivery of laser or electrohydraulic lithotripsy

IV. COLONOSCOPY

A. Diagnostic and therapeutic indications

Colon Cancer screening
  2nd most common cancer
  Most colon cancers arise from polyps
  Polyp to cancer sequence usually slow (10+ years)
  Cancer mortality decreased by early diagnosis
    Removal of precursor lesions – i.e. polypectomy
    Use of mucosal resection techniques for even very large polyps
    Screening programs for colon cancer more cost effective than mammography
    Routine screening at age 50
  Increased appreciation of genetic factors in colon cancer
    Description of gene deletions
    Familial polyposis, non-polyposis syndromes. @20-25% of cancers familial
    Heightened screening with familial predisposition
    Potentially >50% Colon cancers preventable
  Once polyp or cancer found – increased risk of synchronous or metachronous lesions.

Other colon cancer screening techniques
Chronic GI Blood loss
  1-5% of asymptomatic population +FOBT
  10% of these cancers
  10-15% polyps

4.6
99% of lesions in colon
But insensitive screening test
Gene mutations detected PCR amplification of fecal DNA
Virtual colonoscopy

**Lower GI Hemorrhage**
Occasionally useful with rapid purge
Treatment of angiodysplastic lesions with bicap, lasers
Not as effective as in upper GI bleed.

**Inflammatory bowel disease**
Diagnose extent of disease
Monitor activity if rectal sparing
Screening for malignancy in ulcerative (and Crohn's) colitis
After 7-years (Crohn's 15-years)
Significance of dysplasia

**Decompression of colonic distention**
Ogilvie's syndrome, perhaps best left alone

**Complications**
Blunt and electrosurgical perforations 0.2%
Hemorrhage following polypectomy 1-2%
Fatality rare in diagnostic cases

V. SMALL BOWEL ENDOSCOPY

A. Limited indications at present
   Need for small bowel biopsy - i.e. sprue

B. Unexplained GI bleeding
   Push enteroscope - proximal jejunum
   Sonde enteroscope
   Tiedious and incomplete examination
   Endoscope passes by gravity
   View on withdrawal
   Surgical approach
   Long scopes and open abdomen
   Prolonged ileus post-surgery

C. Capsule Endoscopy
   For detection of occult GI bleeding lesions
   Small bowel tumors
Capsule contains videocamera, strobe light and battery, transmitter
Passes through GI tract by peristalsis
2 images/second transmitted to recorder
Position roughly determined by sensor array worn by patient
6,000 images reviewed on computer (@1 hour)
As yet no therapeutic potential.

VII. FUTURE INNOVATIONS

Expanded use of endoscopic ultrasound
Spectroscopy
Fluorescence therapy

V. LAPAROSCOPY

A. Technique

Rigid instruments with video chips
Insertion just below umbilicus
CO₂ insufflation
Anesthesia not required

B. Gastroenterological indications

Evaluation of unexplained ascites
Staging of malignant disease, Hodgkins, pancreatic CA
Guided liver biopsy

C. Surgical indications

Laparoscopic cholecystectomy
Rapid patient recovery in suitable patients
Revolution in gall bladder surgery, combine with ERCP
↑ incidence of complications in learning phase
Other laparoscopic innovations
Segmental colectomy, vagotomy, hernia repair
Feasible, but is it preferable
References


